Remarks

Claim 28 is cancelled and claims 23, 25 and 26 are amended. Claims 17 to 27 are pending in this application of which claims 17, 20, 23 and 26 are in independent form.

Applicant's attorney thanks Examiner Fineman for the personal interview held on May 28, 2004 at which time a draft amendment was presented. At the interview, Examiner Fineman expressed the view that Johnson et al discloses a gradient method. Applicant respectfully disagrees with this view and asks that his argument set forth hereinafter beginning with the second paragraph on page 9 of these remarks be reconsidered. In this context, applicant requests that the term "maximum gradient" be interpreted in the light of his disclosure as explained, for example, at page 11, lines 12 to 22, thereof.

Applicant also respectfully requests that he receive a written response to his traverse of the restriction requirements set forth therein.

Also, this amendment at least with respect to the examined claims 17 to 25 should be capable of being entered because they are directed only to needed corrections of a formal nature and do not raise new issues requiring further search and consideration.

Applicant respectfully traverses the election/restriction requirement because of the commonality of claims 17 and 26.

The original claim 1 contained the feature that:

> "measuring the integral light power downstream of said pupil plane of said objective with said detector;"

On the other hand, original claim 13 contained the features of:

> "an optic defining a pupil plane in said illuminating beam path;
>
> a detector mounted downstream of said pupil plane for detecting the light power of the transmitted light;"

The above means that already the original claims 1 and 13 distinguished between whether there is an incident illumination wherein the illuminating aperture is defined by the objective pupil or a transmitted illumination is present wherein the illuminating aperture is defined by the condenser. What is decisive for the present invention is that the measurement of the integral light intensity takes place below that pupil which images the illuminating pupil. Whether this is the objective pupil or the condenser pupil is, however, only secondary and whether the detection of the light intensity takes place below or above the objective is likewise of no significance. The same commonalities are present in the pending independent claims 17 and 26.

Claim 17 is directed to an incident illumination wherein the objective pupil defines the illuminating aperture and, consequently, the measurement of the integral light intensity takes place below the objective pupil. Claim 26 is, as original claim 13, directed to a transmitted illumination wherein the detection of the integral light intensity takes place after the illuminating pupil viewed in the beam direction. The commonality of the original claims 1 and 13 therefore exists in the same manner as in the present claims 17 and 26. In both claims, the

detection of the integral light intensity takes place behind the illumination pupil viewed in beam direction.

In order to provide still further commonality, claim 26 is amended to incorporate the subject matter of claim 28. In addition to the above commonality, claims 17 and 26 are now further connected in that the gradient method of claim 28 is used to obtain a targeted finding or locating of the optimal position of the motoric drives.

In view of the above, applicant respectfully requests that the election/restriction requirement be withdrawn and that claims 26 and 27 be considered by the Examiner in addition to claims 17 to 25.

On page 3, paragraph 3, claims 23 to 25 are objected to because of the informality noted in claim 23, line 10. Claim 23 is amended herein to correct the informality so that claim 23 and claims 24 and 25, which are dependent thereon, should now be definite.

Claims 17 to 19 and 23 to 25 were rejected under 35 USC 103(a) as being unpatentable over Johnson et al. The following will show that independent claims 17 and 23 patentably distinguish the invention over this reference.

On page 4 of the action, the view is expressed with respect to Johnson et al that this reference discloses:

> "...beginning from a start position and determining the maximum gradient of the light power in dependence upon a position change of said lamp unit relative to said illumination beam path; and displacing said lamp unit in a direction of the maximum gradient of the integral light power until the light power detected by said detector is maximum."

To support this view, the Examiner makes reference to column 2, lines 30 to 57, of Johnson et al. Applicant has carefully reviewed column 2, lines 30 to 57, of Johnson et al and found no reference to a gradient or even a gradient method in this material.

Instead of a gradient method, what Johnson et al does describe is a purely iterative process whose differences to the gradient method are explained in great detail in the applicant's remarks submitted with the amendment filed on September 12, 2003 which are incorporated herein by reference.

Applicant has also carefully reviewed the Examiner's response to his argument set forth on page 5, paragraph 7, of the action. Applicant respectfully disagrees with the view expressed here and submits that the "change of intensity of light power along a given distance/axis" recited at the top of page 6 of the action is really not a determination of a maximum gradient.
In Johnson et al, a change of the light intensity in dependence upon a displacement of the lamp and/or of the collector optics is determined but a change of light intensity in a direction or an axis is not what is commonly known as a gradient. A gradient is generally understood to be not a change but a slope, that is, the quotient of an occurring change (in the present application, the light intensity or light power) and the displacement made which is necessary for this light change. In the present case, the light power or the change of the light power is not only from the displacement in one spatial direction but from a displacement in several spatial directions. The gradient is then not only a scalar quantity but also a vector quantity whose vector

components are the particular partial derivatives:

"($\delta Px/\delta x$, $\delta Py/\delta y$, $\delta Pz/\delta dz$)"

Here, δPx, δPy and δPz are the respective changes of the light power occurring for a displacement in the corresponding x, y, z directions and δx, δy and δz are the respective displacement paths in the x, y, z directions, respectively. In this connection, reference can be made to page 11, lines 12 to 22, of the applicant's disclosure where it is explained in detail that, for the determination of the gradient, the difference of the light power (which results from a displacement of the lamp and/or of the condenser lens) is sequentially determined for the movements of all three drives. Only thereafter is the gradient computed as a vector quantity and from the gradient, the particular direction of movement is determined in which the dependency of the light power on a displacement of the lamp or condenser lens has maximum slope (the gradient therefore has maximum slope).

The claim language of claims 17 and 23 reflects the above description with respect to the gradient method wherein it is expressly recited that:

> "beginning from a start position and <u>determining the maximum gradient</u> of the light power in dependence upon a position change of said lamp unit relative to said illumination beam path; and,
>
> displacing said lamp unit <u>in a direction of the maximum gradient</u> of light power until the light power detected by said detector is a <u>maximum</u>." (emphasis added)

Accordingly, in the applicant's invention, the movement of

the lamp for automatic adjustment therefore does not take place simply successively in accordance with an unknown or previously fixedly predefined sequence in the different directions of movement; rather, the movement takes place always in the direction in which the effect, which is obtained with a displacement, is the greatest because of the maximum gradient of the light intensity. In this way, it is ensured that the adjustment takes place reliably and in a targeted manner because there is always a displacement in the direction in which the deviation from the optimum is a maximum.

In contrast, the method utilized in Johnson et al as described at column 2, lines 30 to 57, proceeds as one would proceed with a purely manual adjustment, namely, one selects a direction and the selection is by chance and, thereafter, one displaces in this first direction until a maximum intensity is reached. Thereafter, a second direction is selected and again one displaces until a maximum intensity is reached. Thereafter, one displaces in a third direction until a maximum intensity is reached. Thereafter, this three step sequence is repeated until one believes that no further improvement can be obtained. In this method, no gradient of the light intensity is determined; rather, only the change of light intensity but not the quotient of change of light intensity and the undertaken displacement path. The displacement made takes place in each case in a pregiven direction of movement independently of whether the targeted improvement is the most efficient in just this direction of movement or in another direction of movement.

As already explained above, the gradient method utilized in

accordance with the invention ensures that the movement always takes place in a direction in which a maximum efficiency of the improvement is ensured.

There is really no suggestion in Johnson et al from which our artisan can hit upon the idea of **first determining the maximum gradient of the light power** and then displacing the lamp unit in **a direction of maximum gradient of the light power** until the light power detected by the detector is a maximum as set forth in applicant's claims 17 and 23.

In view of the above, applicant submits that claims 17 and 23 patentably distinguish the invention over Johnson et al and should now be allowable. Claims 18 and 19 are dependent from claim 17 and claims 24 and 25 are dependent from claim 23 so that these claims too should now be allowable.

Claims 20 to 22 were rejected under 35 USC 103(a) as being unpatentable over Johnson et al in view of Nishi. The following will show that claim 20 patentably distinguishes the invention over this combination of references.

If one would view the microscope of Johnson et al and the projection exposure system of Nishi to be so related to each other that a person of ordinary skill would transfer an idea from the projection exposure system to the microscope, then the object plane in a microscope would correspond to the mask plane in a projection exposure system. The object (the mask) is mounted in the mask plane R in FIG. 1 of Nishi and is illuminated by the illuminating beam path and this mask is imaged on the wafer W via the objective PL.

Viewing Johnson et al and Nishi in the same manner, the projection lens PL corresponds to the microscope objective 6 and the wafer plane W corresponds to the detector 32 or the focal plane of the ocular 8. Viewed from their optical concept, projection exposure systems corresponding to Nishi are more analogous to transmission microscopes, which are operated with transmission illumination, that is, in an embodiment similar to FIG. 4 of the present application and, the location at which the detector 58 of Nishi is mounted corresponds in this analogy to a position behind the objective viewed in beam direction. The plane, which corresponds to the plane of the microscope viewed in the optical beam path, is therefore the reticle plane or reticle stage in a projection exposure system. However, no detector is arranged in this reticle stage 53 so that our person of ordinary skill could not derive from Nishi the idea of arranging a detector on the object stage of a microscope which corresponds to the reticle stage in a projection exposure system.

In view of the above, applicant submits that claim 20 patentably distinguishes the applicant's invention over the combination of Johnson et al and Nishi and should now be allowable. Claims 21 and 22 are both dependent from claim 20 so that these claims too should now be allowable.

Reconsideration of the application is earnestly solicited.

Respectfully submitted,

Walter Ottesen

Walter Ottesen
Reg. No. 25,544

Walter Ottesen
Patent Attorney
P.O. Box 4026
Gaithersburg, Maryland 20885-4026

Phone: (301) 869-8950

Date: June 1, 2004